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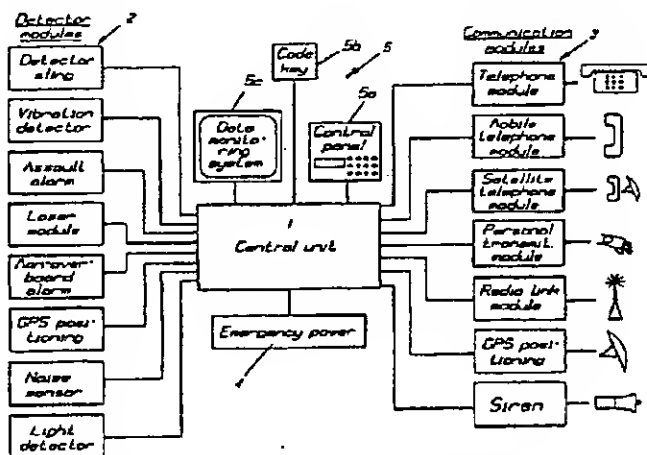
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(54) Title: METHOD AND APPARATUS FOR WATCHING/SUPERVISING AND ALERTING STATIONARY AND/OR MOBILE OBJECTS



(57) Abstract

A method and an apparatus for watching one or more stationary or mobile objects by means of an apparatus comprising a central unit (1), any optional number of detector modules (2) and one or more communication modules (3), whereby any optional combination of detector modules (2) can be connected to the central unit (1), and any optional combination of communication modules (3) can likewise be connected to the central unit (1), and in which apparatus the central unit (1) receives and eventually treats information of existing irregularities in the detector modules and passes on such irregularities in the form of alarm from two or more of the communication modules, namely both by a convention sound and/or light alarm, and also via a telephone module and/or via a car mobile telephone and/or via a satellite telephone module and/or via a radio link and/or via a GPS module.

METHOD AND APPARATUS FOR WATCHING/SUPERVISING  
AND ALERTING STATIONARY AND/OR MOBILE OBJECTS.

The present invention generally relates to a method and an apparatus for watching/supervising and alerting one or more objects and/or a large or a  
5 small area by means of an alarm system of universal type. The system is intended to be used for a large variety of alarm needs, whether there is question of alerting stationary or mobile objects, and which system can be combined for a great many purposes, and which can at any time be changed to suit other purposes, or can be completed for being able to be used for  
10 further functions.

Most alarm systems known to-day are based on the idea that one or more stationary objects are marked by means of a current conducting strip, a photo cell system, vibration sensitive sensors, light sensitive slings etc., which are connected to an alarm activator, and which upon actuation, for  
15 instance due to ruptures on conduits, interruption of photo cell light rays, vibrations or noises of a special minimum strength provides a signal to the alarm indicator that alarm is to be given. Normally the alarm is a sound alarm, but in certain systems it can, in combination therewith, also arrange a telephone call to an alarm supervision station or to the police.

20 Such known alarm systems are mainly suited for a certain specific alarm program, and they can often not be changed to suit another alarm program or can not be completed by further alarm functions. In front of all many known alarm systems have no possibility of giving alarm for mobile objects such that alarm signals can be received at a far away located alarm  
25 receiving station, at which place it is possible to make sure what the alarm is concerned with and exactly where said mobile object is located when alarm is given.

The object of the invention therefore has been to solve the problem of providing an almost universally useful alarm system, which can be used in a  
30 great many various fields of use, for instance for alerting large or small stationary objects, large or small ground areas, movable objects like land vehicles or water crafts, which system can be used as an alarm means for a large number of alarm areas, separately or in combination with each other, for instance as a fire alarm, a burglar alarm, an alarm of approaching  
35 trespassing persons or objects or as an approach alarm, a theft alarm, an assault alarm, a man-over-board alarm and for many other purposes, and

which can be set up in practically any optional combinations, and which also can be formed so that the alarm directly marks almost exactly where an alarm giving object is located at each moment; from where a trespassing into an alerted area comes; towards or from which alerted object that movements are made; which can be formed as a man-over-board alarm which indicates if any one leaves an alerted object or area; which can be formed as a two-stage alarm, by means of which a warning signal is given when an object approaches an alerted area, and an expressive alarm is given if said movable object continues its trespassing into the alerted area, etc.

10 An important feature of the alarm system is that it is formed so as to indicate, on each alarm situation, at least two, or preferably at least three or more alarm functions at the same time, namely a conventional sound alarm at the alerted area, and in addition thereto one or more further alarms to an alarm receiving centre or to the police by means of telephone, mobile  
15 telephone, radio link or a satellite system.

It has been possible to provide such a universal alarm system in that it is composed by a large number of modules which can be combined in any optional constellations, and in which the system comprises three main parts, namely

- 20 a) a Central Unit which is the collecting, registering and operating heart of the system,
- b) one or more Detector Modules which are, or can be, connected to said Central Unit for observing non-desired movements, and
- c) one or more Communication Modules which are, or which can be,  
25 connected to said Central Unit, and which upon request from said Central Unit transmits information of an observed movement to any alarm receiving means, in the form of a sound signal, and/or by means of a mobile telephone module, and/or by means of a module for conventional telephone calling or a calling over a satellite system, and/or over a radio link, and/or by means of a  
30 position determining module, in the following referred to as a GPS module.

The central unit is fully controlled by a processor having logical functions for handling of the memory and for the flow of signals. By such system updating and upgrading of the security system can easily be made, in particular as concerns the software of the system, and it also gives a  
35 possibility of an almost unlimited extension of both the software and the hardware of the system.

All additional modules of detector type or communication type, which are connected to the central unit have a unique identity which is continuously checked by the system, and this makes it impossible, or very difficult, to affect the safety system by an external and non-authorized  
5 actuation.

The central unit (module) continuously gets information from the components and from the modules of the safety system and thereby provides a continuous checking of the condition of the components and modules and that all parts of the system are fully operable, and in front of all  
10 it immediately gives information if any module should happen to drop out.

The Detector Modules may comprise conduits, sound slings, vibration slings, photo cell slings etc. for directly marking the existence of a non-desired trespassing. In a special embodiment a detector module is formed as a wireless assault alarm the indication signal of which is directly, and in a  
15 wireless mode, received and handled and is passed on by the central unit.

Another favourable possibility is to make use of a laser unit as a type of invisible and impenetrable fence which, eventually over a system of mirrors, makes it possible to provide an alert of a large number of stationary objects or a large ground area using one single laser unit; by using two or  
20 more parallel laser units it is easily possible to get an indication from what direction a trespassing object or any other movement comes; it is also possible to make use of such a possibility as a man-over-board alarm, both on land vehicles and on water crafts, whereby alarm is given when anyone or anything leaves an alerted area.

It is also possible to make use of sweeping laser beams for watching surfaces or fixed point objects. Such a laser module can preferably be used as a pre-warning system of the type "approach sensor" or an "early-warning  
25 sensor" of manned objects.

In a further preferred embodiment of the invention the detector module comprises a means connected to a communication module for exactly, and with an accuracy of only a couple of meters, indicate the position of the object from which the alarm comes, for instance by a so called GPS system (Global Positioning System), and whereby it is possible to  
30 continuously follow the movement of the alerted object and to trace a vanished object. The GPS system thereby can be used, in reversible operations, as a detector module and as a one-way communication module.

The system also can be used for giving alarm if an object should move along a different course than a certain stored course, or by a different speed than a certain stored speed, or if the alerted object moves out of an predetermined area claimed by the system.

5       The detector also can be formed so as to give alarm in several various stages, for instance by an "Inner" warning alarm when an object approaches as far as to a certain distance from the alerted object or area, and an "expressive" alarm if the object thereafter continues to move towards the alerted object or area.

10       Further detector modules which may be interconnected in the system are heat sensor modules, light sensor modules etc.

      The Communication Modules can be a mobile telephone module, a conventional telephone module, a radio link, a satellite telephone module or a GPS module, which upon request by the central unit sends information to  
15       an alarm central, which information may contain particulars of the type of existing trespassing etc., from what direction towards and away from the alerted object or area that the movement comes, exactly in what position the alerted car or boat is located, etc. As mentioned above a GPS module also can be used as a detector module.

20       A Control Panel or A Service Panel may, if desired, be connected to the central unit for making it possible to set various alarm functions, for checking the alarm system, for choosing various steps or levels of steps in case of received alarm, for input of desired telephone numbers in desired priorities, for instance to an alarm central station, to the police, to the fire  
25       brigade etc., or for adjusting or re-setting one function or another.

      Further, a Code Key can be connected to the central unit for security coding said central unit, thereby allowing access only by authorized people.

      Still further, a Data Monitoring System can be connected to the central unit for continuously monitoring and supervising both the system and  
30       any movable or stationary objects included in the supervision system.

      Now the invention is to be described more closely with reference to a number of alarm systems illustrated as examples in the attached drawings. Figure 1 shows a block diagram of an alarm system according to the invention containing a central unit and a large number of detector modules  
35       and communication modules. Figure 2 shows an example of an alarm system for alerting a large number of objects in a room, and figure 3 shows

a similar alarm system for both exteriorly and interiorly watching a flat, a house or a similar object. Figure 4 shows a system according to the invention for watching a land vehicle and for tracing such a vehicle which may have gone lost, and figure 5 shows a similar system for instance for watching a taxi. Figure 6 illustrates how the system according to the invention can be used for tracing a water craft which has gone lost, and figure 7 shows a system for watching a water craft, which system comprises both an approach alarm means and a watch alarm means. Figure 8 is a side view of an alarm system for observing the direction of a movement towards, as away from an alerted object, respectively, in the illustrated case a boat, and figure 9 is a top view of the same system as that of figure 8. Figure 10, finally, shows a system formed as a watch system for a large land area like a house garden using one single laser unit.

Figure 1 shows the general design of the alarm system according to the invention. The heart of the system is a central unit 1 which receives, treats and transmits information which has been received from one or more detector modules 2 comprised in the system, and which thereby issues a sound or a light alarm at the alerted object or area over one or more communication modules, and also transmits the received, and eventually also treated, information to an alarm central, to the police, to the fire brigade etc.

As mentioned above the detector module can be a current conducting sling, a vibration detector, a wireless assault alarm, a laser module, a noise sensor, a light detector, a direction sensitive "approach" or "retreat" module used as a man-over-board alarm or as an "early-warning-sensor", a GPS module for making it possible for the alarm receiver to almost exactly locate the position of an alerted object, etc.

Alarm is given, as conventional, by a sound or light signal directly at the alerted object or area, and alarm is also communicated from the central unit to an alarm central, to the police, to the fire brigade, to a watch service corporation etc. by means of one or more alternative systems, like by means of telephone, by mobile telephone, by satellite telephone, by radio link, by GPS positioning system or a similar communication system known per se.

An emergency power module 4 preferably can be connected to the central unit 1 for supplying current in case of loss of power whether depending on current failure or that the conduits of current have been cut

off. Further, a control system 5 can be temporarily or permanently connected to the central unit, which system may consist of

- a control panel 5a, by means of which information can be supplied to said central unit, for instance for checking the alarm system, for choosing measurements or levels of measurements to be taken in case of alarm, for introducing desired telephone numbers in a desired priority, for instance to an alarm central, to the police, to the fire brigade etc., or for correcting or adjusting one function or another,
- a code key, by means of which the entire system can be safety coded thereby allowing access to the system only by authorized persons,
- and a data monitoring system, by means of which both the system and any movable or stationary objects included in the supervision system can be continuously monitored and supervised.

Figure 2 diagrammatically shows a system for watching/alerting a large number of objects of a room, for instance pictures in a gallery. In such very simple and effective system there is used a laser unit 6, which via a system of mirrors 7 which has been mounted on each one of several pictures 8 sends a light beam 9 from a laser light transmitter 10, which can be considered a detector module, via the correctly adjusted mirrors 7 to a laser beam receiver 11, which is a communication module, and in which the laser unit with the transmitter 10 and the receiver 11 is connected to the central unit. In case of absence of light in the laser light receiver 11 said central unit gives alarm and transmits information thereof to an alarm central, to the police, to the fire brigade, to the watch central, etc.

Figure 3 shows a similar, but more developed system, in which there is used two co-operating laser units 6a and 6b for watching two or more rooms of a building, and in which the laser beams 9a, 9b, via mirrors 7a and 7b, are transmitted between several objects, and in which system there is further used two parallelly mounted laser units 6c, 6d for watching, via mirrors 7, an area exteriorly of the actual rooms. The purpose of using two parallel laser beams 9c, 9d extending aside of each other is that is thereby possible to immediately obtain information of the direction of the object or the person breaking the laser beams by observing in what order that said laser beams 9c, 9d are broken. By such a system an immediate indication is obtained about objects or persons which approach the alerted locality or leaves the area. Like in the previously described apparatus the laser units



6a-6d are connected to a central module which passes on the alarm as mentioned above.

Figure 4 shows a system for alerting a truck. In case of a theft of said truck sound and/or light alarm is given, as conventional, and in addition thereto the central can transmit a GPS signal 12 received from a satellite 13 to an alarm central 14 or at the police 15. Said GPS signal can be directly followed at the place 14, 15 of receiving said signal, and the position 12' of the alerted vehicle can be identified, and thereby the vehicle can be traced after it has eventually been hidden and has been abandoned. Such a system might make at least some types of assault impossible on transport vehicles for valuables, etc.

Figure 5 shows a similar system designed for taxi cars. In this system alarm is given both by conventional sound and/or light alarm, and the position of the car can be obtained from the GPS 12 via a satellite 13, and also over a radio link 16 from the regular radio equipment of the taxi car, which information is transmitted to the taxi station, to an alarm central 14 and to the police 15.

Figure 6 shows a similar system suited for boats and yachts, and by means of which it is possible to follow and to trace a boat which has vanished, via a conventional sound and light signal, a GPS module 12 and an automatic wireless alarm module 16. It is also possible, by means of the GPS module, to program certain routes or courses that the boat is to pass, so that alarm is immediately given if the actual course of boat differs from the programmed course, for instance in case the boat has been stolen, if the boat by mistake has come completely out of course, if the boat, for instance depending on engine failure, happens to drift in disabled condition, etc. Alarm can preferably be given to the police, to the fire brigade, to the sea rescue brigade, etc.

Figure 7 illustrates the system according to figure 6 completed by an "approach" alarm, for instance comprising a laser module having a sweeping laser beam which when initially observing an object or a person approaching the boat issues a first warning signal 17 which is received as internal alarm inside the boat. If the object or the person continues moving towards the boat an expressive alarm is given via sound and light alarm and in addition thereto the position via GPS 12, via wireless telephone, via radio telephone, via satellite telephone or a similar means 16 to an alarm central, to the

police etc. The boat alarm system, of course, also can contain a heat sensor module which gives alarm in case of fire on board, or a water sensor giving alarm in case the boat happens to take in water up to a certain level.

Figures 8 and 9 show a direction indicating alarm, which can be used for giving alarm if anyone passes the rail of the boat, whether towards or away from the boat. In the illustrated case there is used three laser units having transmitters 10 mounted at one end of the boat and which have receivers 11 at the opposite end of the boat, and in which system three individual laser beams 9, provided on different levels, and in particular in different horizontal directions, indicate if anyone or anything passes the rail of the boat. Said indication also gives a clear information if the movement takes place towards or away from the boat. In said latter case the system is considered a "man-over-board" alarm which upon actuation issues a sound or light alarm and also alarm via telephone, mobile telephone, satellite telephone, radio link and/or GPS to any type of alarm central, to the police, to the fire brigade, to the sea rescue brigade, to the ambulance etc.

In a further development of said man-over-board alarm a further module can be connected, namely a module looking like a wrist watch and having a radio transmitter and which is worn by each person on board (in a bus, in an air plane etc.) and which is arranged to issue a continuous carrier wave having a very restricted range, for instance only 10-20 metres, which carrier wave is apprehended by the central unit 1 as an indication that the person in question is within a certain distance from the central unit, but which apparatus stops issuing said carrier wave for instance if the person in question falls over board and the module lands under the water level, or in which system said carrier wave can no longer be received by the central unit if the actual person moves out of the range of the transmitter. As soon as the carrier wave is no longer received by the central unit alarm is issued indicating that the person in question may have fallen over board and has landed in the sea, or that the person in question has moved too far from the central unit.

Figure 10 shows how the system according to the invention can be used also for alerting a large ground area. In this case there is used a detector unit, for instance a laser unit for providing an invisible fence which, via mirrors 7, for instance placed on a fence or on posts, is arranged to give alarm of one or more levels if the laser beam 9 is broken.

## Reference numerals

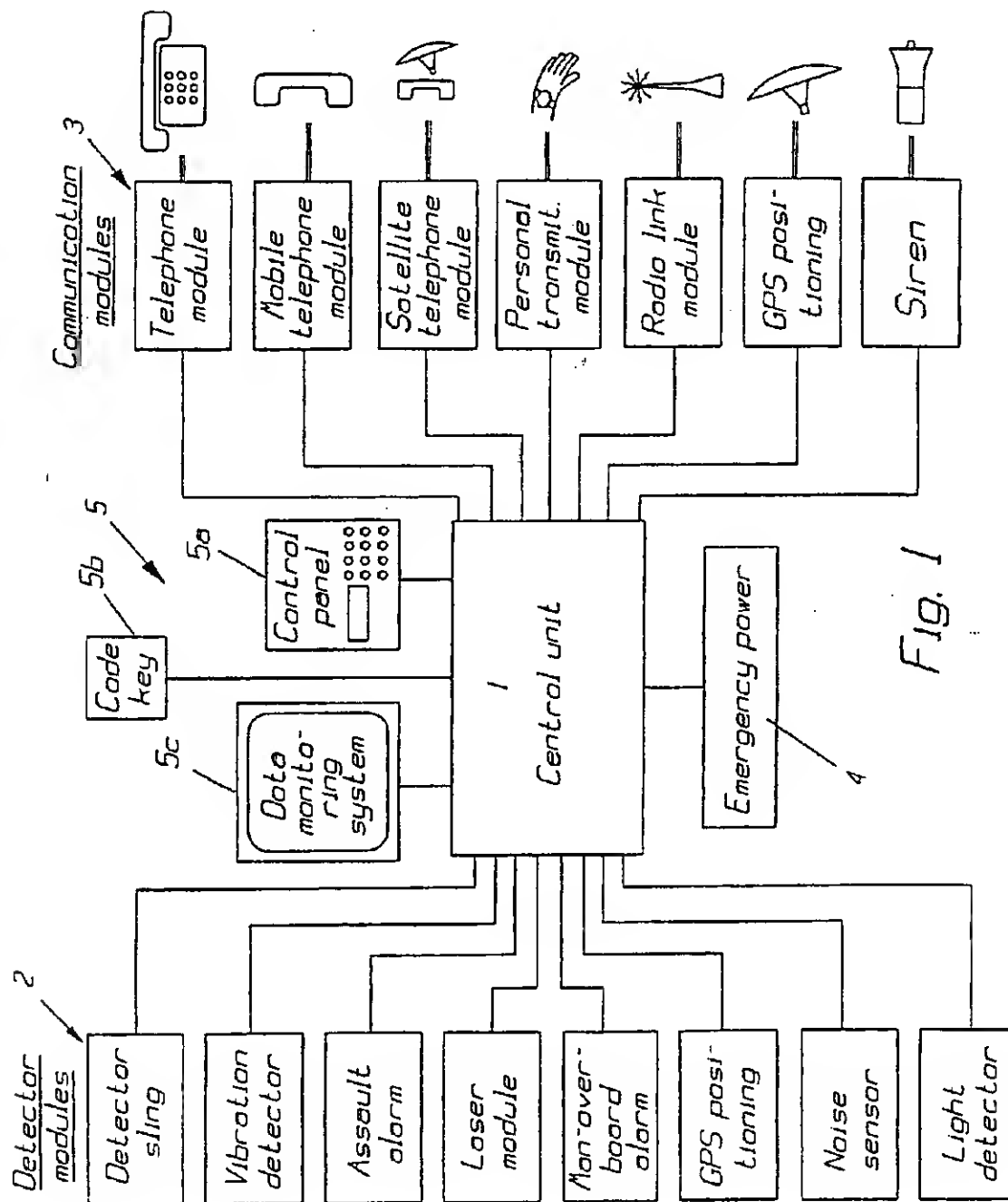
	1	central unit	11	laser receiver
	2	detector module	12	GPS module
5	3	communication module	13	satellite
	4	emergency power	14	alarm central
	5	control system (a, b, c)	15	police, fire brigade etc.
	6	laser unit	16	radio link module
	7	mirror	17	fence, post
10	8	picture		
	9	light beam		
10	10	laser transmitter		

## CLAIMS

1. A method of watching one or more stationary or mobile objects by means of an apparatus comprising a central unit (1), any number of detector  
5 modules (2) and one or more communication modules (3), characterized in that any combination of detector modules (2) is connected to the central unit (1), in that any combination of communication modules (3) is likewise connected to the central unit (1), and in that the central unit (1) is arranged to receive and treat information of existing irregularities in the detector  
10 modules (2), and to give alarm by means of at least two different alarm systems if such irregularities exist, namely by means of a conventional sound and/or light alarm, and also via a telephone module or a satellite telephone module and/or via a mobile telephone module and/or via a radio link and/or via a GPS module.
- 15 2. A method according to claim 1, characterized in that a GPS module (12) is connected to a mobile object like a car, a boat etc., and in that said GPS module is arranged to automatically open, when alarm is given, a communication to an alarm central, to the police, the fire brigade, the sea rescue brigade etc. from where the position of the mobile object is  
20 continuously watched and from where said object can be traced.
3. A method according to claim 2, characterized in that the GPS module (12) is arranged to give alarm if said mobile object leaves a predetermined programmed area or a programmed course of movement.
- 25 4. A method according to claim 1, 2 or 3, characterized in that one or more laser units (6) are connected to the central unit as a detector module, and in that the laser light beam (9) transmitted from each laser unit transmitter (10) is reflected to a receiver (11) of the corresponding laser unit by means of mirrors (7) placed on or around objects to be watched.
- 30 5. A method according to claim 4, characterized in that two or more laser units (6a-6d) are mounted aside of each other, and in that the direction of movement of an object passing the laser beams (9) is noted by observing in what order said laser beams (9) are broken.
- 35 6. Apparatus for executing the method according to any of the preceding claims, characterized in that the apparatus is composed of separate modules which can be interconnected in any optional numbers and any optional combinations, and in which the apparatus comprises

- a central unit (1) comprising means for receiving, treating and passing on information,
  - any optional numbers of detector modules (2) which can be connected to the central unit (1), and which indicate when anything happens at a watched object or within a watched area, and
  - any optional numbers of communication modules (3) which can be connected to the central unit (1) and which transmit to an alarm central, to the police, to the fire brigade, to the sea rescue brigade etc. the events which have been observed by the detector modules (2) and which may eventually have been treated by the central unit.
7. Apparatus according to claim 6, characterized in that the detector modules comprise detector slings, vibration detectors, noise sensors, wireless assault alarm means, laser units, man-over-board alarm units, GPS units, sound and light detectors, approach sensors, etc.
8. Apparatus according to claims 6 and 7, characterized in that the communication modules comprise modules for automatically pass on alarm via telephone, satellite telephone, radio link, GPS satellite, siren, light alarm system, etc.
9. Apparatus according to claim 7 or 8, characterized in that two or more detectors, in particular laser detectors (6) are used parallelly to each other for making it possible to observe from what direction a not-wanted trespassing is made by observing the order in which the detectors are actuated.
10. Apparatus according to claim 7 or 8, characterized in that the apparatus, in combination with other detectors, comprises detectors having a sweeping laser beam which at an initial observation of an object approaching the alerted object issues an internal "approaching alarm", and which, if said object continues approaching the alerted object issues an expressive alarm in the form of a sound and/or light signal and an alarm over telephone, satellite telephone, mobile telephone, radio link, GPS or a similar communication module.

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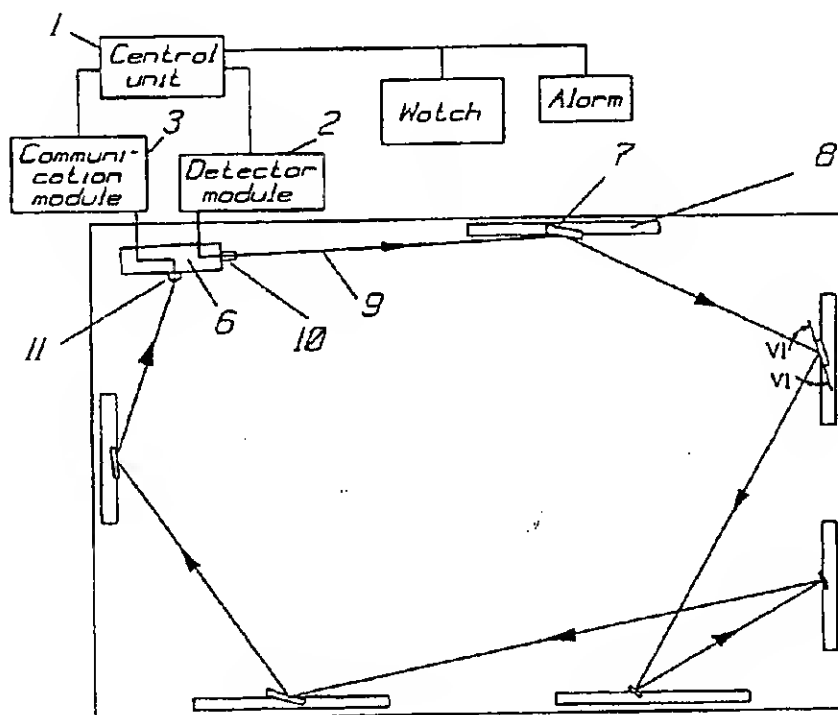


Fig. 2

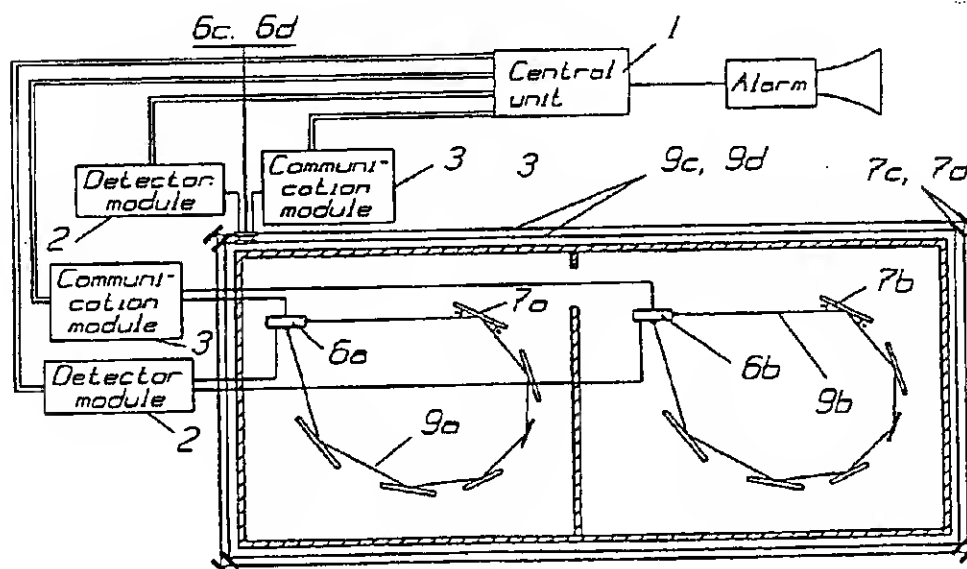


Fig. 3

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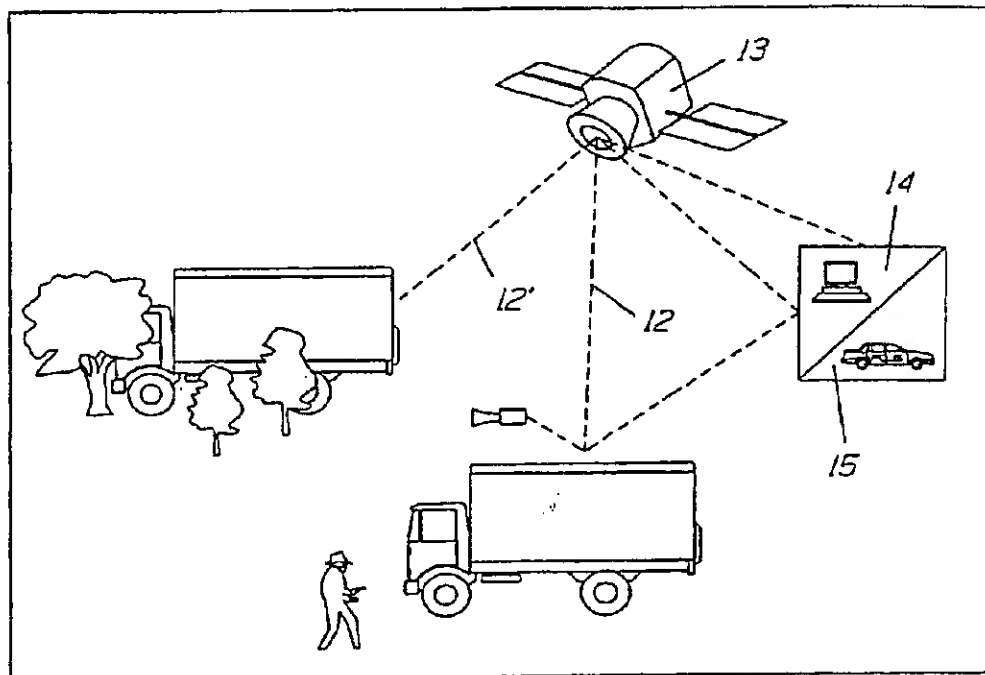


Fig. 4

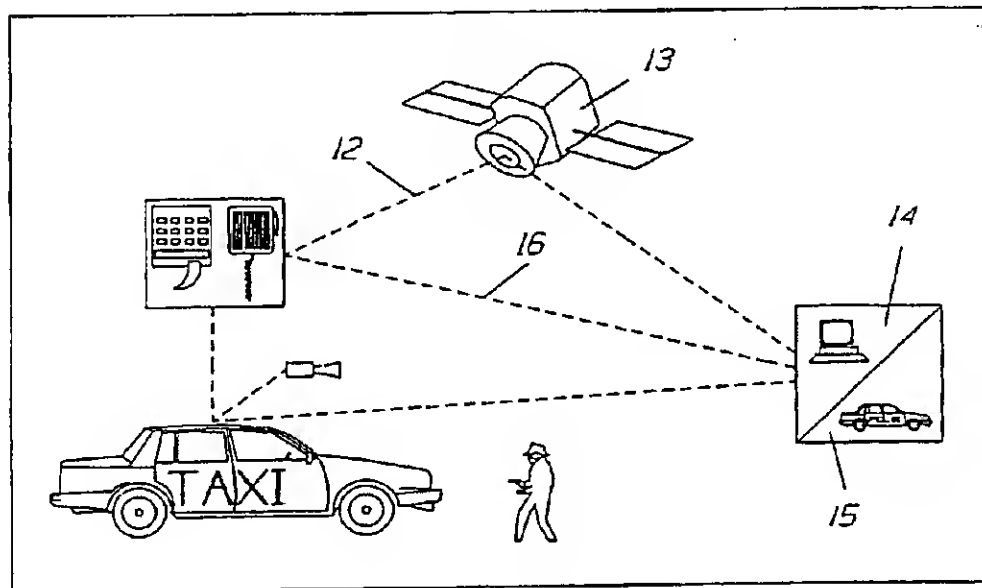


Fig. 5



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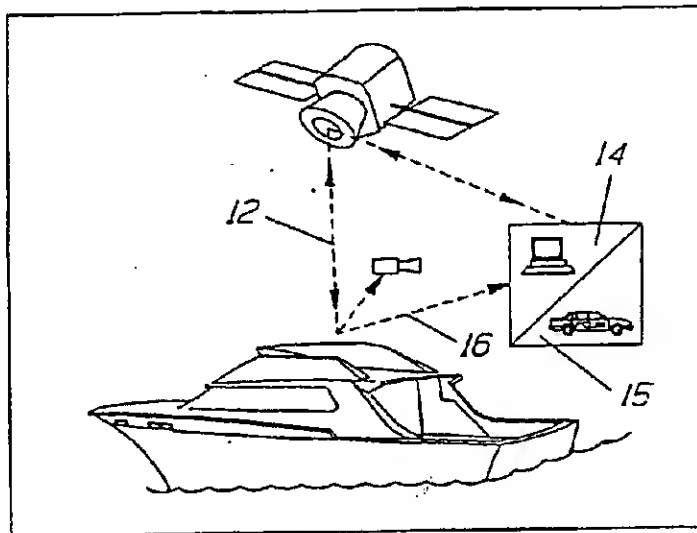


Fig. 6

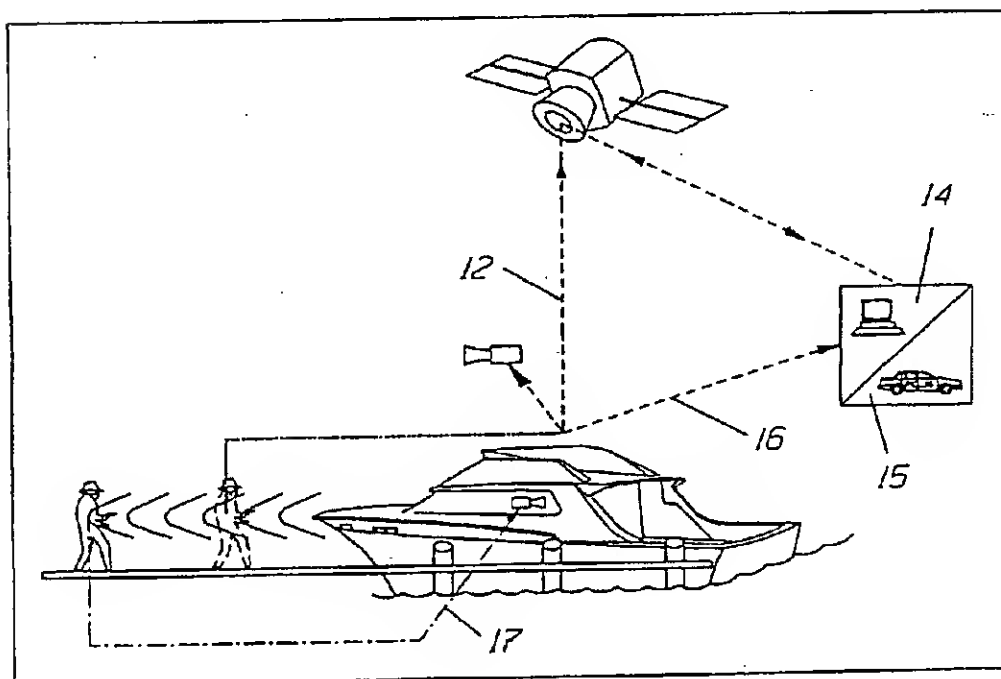


Fig. 7

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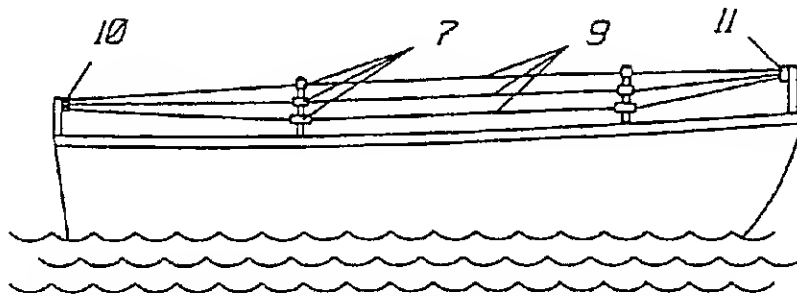


Fig. 8

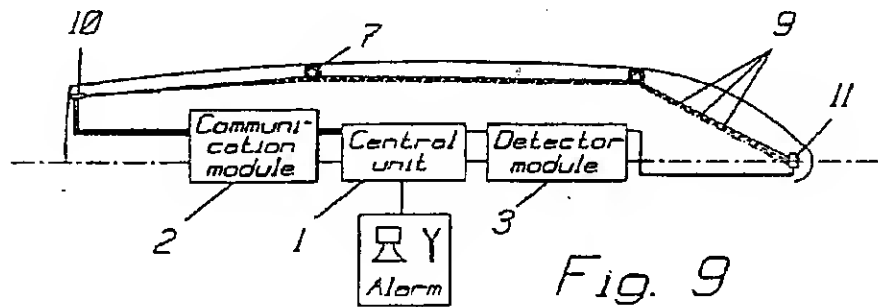


Fig. 9

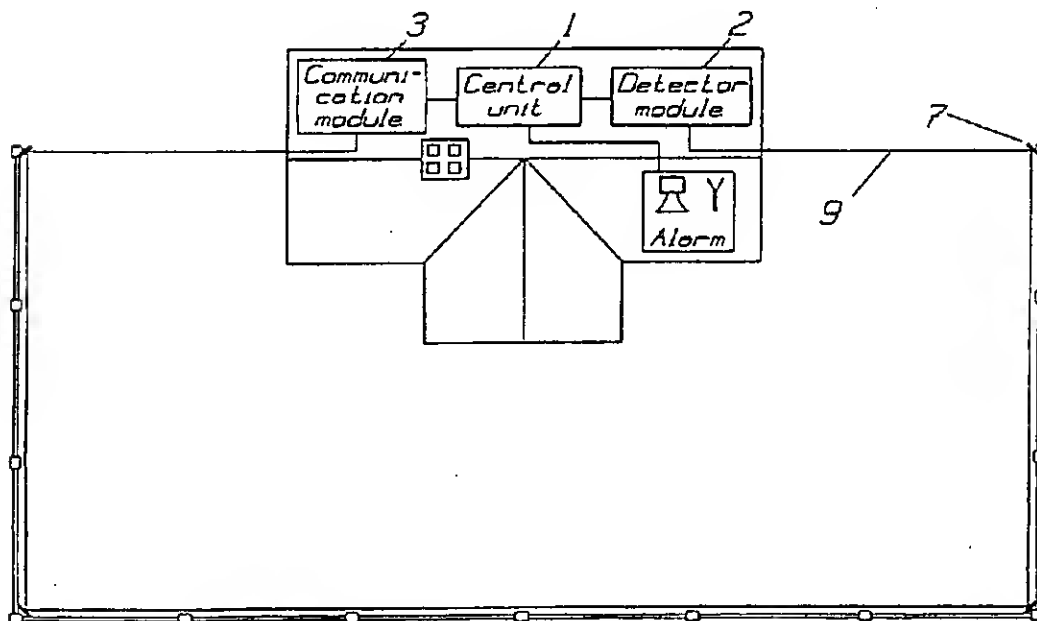


Fig. 10

# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/SE 95/01243

<b>A. CLASSIFICATION OF SUBJECT MATTER</b>		
IPC6: G08B 25/10, G08B 13/183 According to International Patent Classification (IPC) or to both national classification and IPC		
<b>B. FIELDS SEARCHED</b>		
Minimum documentation searched (classification system followed by classification symbols)		
IPC6: G08B		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
SE,DK,FI,NO classes as above		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)		
WPI		
<b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b>		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4195288 A (HENRY H. MORTON), 25 March 1980 (25.03.80), column 1, line 66 - column 3, line 19	1,6-8
Y	--	4,5,9,10
X	EP 0388756 A2 (DI DIO RUSSO, VINCENZO), 26 Sept 1990 (26.09.90), column 2, line 18 - column 3, line 43	1,6-8
Y	--	4,5,9,10
<input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C. <input checked="" type="checkbox"/> See patent family annex.		
* Special categories of cited documents "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier document but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later documents published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family		
Date of the actual completion of the international search		Date of mailing of the international search report
26 February 1996		27-02-1996
Name and mailing address of the ISA/ Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. +46 8 666 02 86		Authorized officer Peter Jacobsson Telephone No. +46 8 782 25 00

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## INTERNATIONAL SEARCH REPORT

International application No.  
PCT/SE 95/01243

## C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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